Illinois Department of
Natural Resources
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Pat Quinn, Governor
Marc Miller, Director

May 9, 2011

Mr. Paul Shetley, Director
Environmental Resources Training Center
Southern Illinois University Edwardsville
Campus Box 1075
Edwardsville, IL 62026

RE: ERTC Wind Turbine, Edwardsville, Madison County
Endangered Species Consultation Program
EcoCAT Review #1111633

Dear Director Shetley:

The Department recently became aware of the construction of a Polaris 20-kilowatt wind turbine at the Environmental Resources Training Center (ERTC) during the week of April 11, 2011. Because the construction and operation of wind turbines have the potential to adversely modify environmental conditions, such actions--when authorized, funded, or performed by state agencies or local governments--are subject to the requirements for consultation with the Department of Natural Resources in accordance with the *Illinois Endangered Species Protection Act* [520 ILCS 10/11], the *Illinois Natural Areas Preservation Act* [525 ILCS 30/17], and Title 17 *Illinois Administrative Code* Part 1075.

Consultations provide the greatest benefits when conducted as early as possible in the planning process. Unfortunately, this action was not submitted to the Department for consultation prior to implementation. The turbine is now installed and operational, but in a location which may adversely modify a dedicated Illinois Nature Preserve protected by the *Illinois Natural Areas Preservation Act*, an outcome consultation is intended to avoid.

Several properties directly west of the ERTC across New Poag Road have been designated by the Department as the **Bohm Woods INAI Site**. Discrete but contiguous portions of this INAI Site have been dedicated by the Illinois Nature Preserves Commission, on varying dates, as the **E. Dora Bohm Memorial Nature Preserve**, the **William and Emma Bohm Memorial Nature Preserve**, and the **Bohm Woods Nature Preserve**. The latter 92-acre Nature Preserve is owned and managed by the Illinois Department of Natural Resources, although the other Preserves remain in private ownership. The Illinois Nature Preserves Commission exercises joint jurisdiction over Nature Preserves with their owners.

Bohm Woods Nature Preserve begins at the western outside right-of-way boundary of New Poag Road. From the location description you provided me during our April 15 telephone

conversation and photographs provided by the Nature Preserves Commission, the turbine appears to be located considerably less than 200 feet from the Nature Preserve boundary.

On the basis of the information currently available to the Department, it is the Department's biological opinion the operation of the wind turbine is likely to adversely modify environmental conditions within this complex of Nature Preserves.

This letter requests additional information about the ERTC and the wind turbine which may allow the Department to refine its estimates of potentially adverse effects and recommends actions which may be taken by the University to avoid, minimize, or mitigate adverse effects.

The Department has obtained from the manufacturer's web-site the specification sheet which describes physical dimensions and operating characteristics of the wind turbine. However, the Department needs more specific information about the turbine's precise location at the ERTC, including the shortest distance from the turbine to the Nature Preserve boundary. The turbine's position relative to the ERTC main building and parking areas, and the height of the ERTC building are also relevant. *This information should be included in the Detailed Action Report.*

Visibility. The ERTC turbine is readily visible from the Nature Preserve's visitor parking area, from the old field adjacent to New Poag Road, and from the margins of the forest beyond. (It will not be visible from the interior of the woods.) However, these portions of the Nature Preserve do not have a high value for visualizing pre-settlement or primeval conditions, given the traffic on New Poag Road and the long-established presence of the ERTC itself. *It is the Department's opinion the turbine's visual impact, though obvious, is likely not significant.*

Shadows. Wind turbines produce a shadowing effect often dubbed "flicker." Sunlight (or moonlight) passing through the moving turbine blades casts moving shadows, well-known to irritate human beings within the shadow and suspected to alter animal behaviors. Many factors affect the severity of shadow-flicker: the orientation and altitude of heavenly bodies; wind direction (which alters the plane of the rotor's rotation); wind speed, rotor speed, and atmospheric conditions (which affect both light intensity and diffraction).

Given the height and location of the turbine, flicker perceptible to humans will likely be present within the Preserve boundaries only with the sun at an altitude less than forty degrees from the eastern horizon, i.e. early morning. It will extend across the visitor parking area near the winter solstice. It may have its greatest potential effect on wildlife with important crepuscular activity periods which may be present in the old field and the eastern margin of the woodlands. But with an operating rotation of 100 rpm, occultation will be at a frequency as high as 5 Hertz (which does not simulate the passage of an aerial predator), and atmospheric diffraction will lessen shadow definition, so that flicker shadows may be blurry and indistinct. Given its ten-meter diameter, the area of the Preserve affected at any instant will be very small, even when the wind direction maximizes the rotor profile.

It is the biological opinion of the Department shadow-flicker from the turbine is unlikely to adversely modify physical or biological conditions within the Nature Preserve to any significant degree.

Noise. According to the manufacturer, the Polaris P10-20 produces noise levels of 50-55 db at 100 feet. On the "A-weighted" decibel scale, this is slightly louder than the level of normal conversation. Sounds attenuate rapidly with distance and may be masked by other noise sources. If the turbine is roughly 200 feet from the Nature Preserve boundary, the turbine is likely not audible *to humans* within the Nature Preserve. Traffic noise from New Poag Road, though not continuous, is much louder and is audible throughout much of the Preserve. However, many species of wildlife respond to higher or lower noise frequencies than those audible to humans.

If sounds from the turbine do penetrate the Preserve, they are more likely to occur within the low frequency ranges, which attenuate slowly, rather than in the ultrasonic frequencies, which attenuate quickly. It is possible low-frequency sounds emitted by the wind turbine may alter the noise environment within the Nature Preserve. Low-frequency anthropogenic noise may be particularly detrimental to bats foraging in and near the Nature Preserve because many bat species employ passive listening strategies to nearly the same degree as echo-location, but the passive strategy uses the low-frequency range. A complete frequency-range sound-emission profile of the Polaris turbine is probably not available, and sound emissions from this machine may vary from those of others due to idiosyncrasies. However, it is known that smaller wind turbines do produce low-frequency sound.

It is the Department's biological opinion the sound emissions of the wind turbine are likely to adversely modify biological conditions within the Nature Preserve, although the degree and significance of alterations is unclear.

Bird/Bat Mortality. Commercial-scale wind turbines are a well-documented source of mortality to birds and bats due to collision and, for bats, to baro-trauma. The Department is unaware of any scientifically-rigorous study of mortality associated with turbines in the 20-kilowatt class. The typical assumption is that, being smaller, such machines kill fewer animals. The Department is skeptical animal mortality is simply a matter of scale. The distinctively different configuration and operating characteristics of these machines and their locations may render these turbines more dangerous to wildlife, not less.

Most animal collisions with wind turbines occur at night, and are often associated with mass movements during migrations. However, in the right circumstances, considerable mortality may occur during foraging activities, which most often occur at lower elevations than migratory movements. Bohm Woods Nature Preserve provides suitable forest habitat to support breeding colonies of most bats endemic to Illinois, including the federally-listed endangered **Indiana Bat**, *Myotis sodalis*. Although no survey of bat species or numbers in Bohm Woods has been performed, bats are undoubtedly present in these high-quality woodlands.

Street lights (and those in parking lots) concentrate night-flying insects, which in turn attract insectivorous predators, including bats. Those at ERTC are on standards considerably shorter than the wind turbine, which is an advantage. Nevertheless, there is little doubt that bats roosting in Bohm Woods forage above the parking area at the ERTC. The placement of the wind turbine adjacent to the parking area increases the probability bats will be killed by collision with the

wind turbine. This, in turn, will reduce the suppression of insect populations in the Nature Preserves by bats, thus adversely modifying the existing ecological balance within the Preserves.

It is the biological opinion of the Department the operation of the wind turbine in this location is likely to adversely modify the Bohm Woods Nature Preserve through alteration of its internal predator/prey relationships due to mortality of insect predators feeding outside the Preserve.

It is the obligation of the University to evaluate means to avoid, minimize, or mitigate for potential adverse effects. The Department recommends evaluation of and/or implementation of the following actions.

Recommendation #1. Given the dearth of research on the mortality potential of turbines of this size, it would be of scientific and ecological value to perform a rigorous mortality study of birds and bats during normal operation of this turbine. Reliable quantitative data is the starting point for managing the adverse impacts associated with this technology.

The Department recommends the University implement a detailed mortality study by periodically searching for bird and bat carcasses using methodology which will permit accurate estimation of bird and bat losses during a season, with a view toward determining whether mortality is constant or experiences significant peaks associated with migratory events. Ideally, searches would occur from April through November on a regular schedule.

Recommendation #2. If mortality rates warrant mitigation, the Department recommends experimentation with methods to reduce mortality such as curtailment (idling the turbine during periods of low wind speed), not operating the turbine during high-mortality risk periods, not operating for certain evening hours of peak activity, operating without lighting the parking area; and testing acoustic deterrents.

Recommendation #3. The Department recommends the University conduct surveys of local bat populations with the objectives of (a) identifying the species active locally; (b) estimating local population numbers, (c) identifying important roosting and foraging areas, and (d) establishing the relative importance of mortality losses due to the turbine's operation. Studies could be done through the use of several technologies, including acoustic monitoring, mist-netting, high-speed thermal imagery, and telemetry. If the University is contemplating the use of larger commercial-scale wind turbines on or near the campus, such studies of local bat populations will prove extremely useful.

Recommendation #4. The Department recommends a flicker study which identifies the theoretical extent and duration of flicker beyond New Poag Road within the Nature Preserve and compares it to actually observed flicker within the Preserve. The latter effort can be done manually or through the application of light-sensing technology. The comparative effort should account for such variables as light intensity, relative humidity, barometric pressure, particulate pollution (dust), wind direction and speed, rotor speed, etc. This effort can provide a better understanding of the significance of flicker shadow impacts associated with similar machines.

Recommendation #5. The Department recommends the University undertake an acoustic study of turbine's noise environment and turbine noise effects, including establishing a complete acoustical profile of the machine at varying wind speeds, assessing the decibel levels of various frequencies, and measuring the distances at which attenuation or masking (interference) of emitted sound occurs. Such data will assist in evaluating impacts to the Nature Preserve and to various wildlife species, including bats.

Many of these studies, or aspects of them, would supply suitable research subjects for students or faculty from a variety of disciplines represented at the University.

Prospective Bat Listings. No discussion of wind turbine impacts to bats would be complete without mention of *White-Nose Syndrome* (WNS). First identified in 2006 in New England, this fungal disease is decimating bat populations and spreading rapidly across the country. White-Nose Syndrome is now present in Indiana, Kentucky, and Missouri, though it has yet to be detected in Illinois. Some hibernaculae have experienced 97% losses of their bat populations.

The advent of WNS raises the prospect that several species of bat now common in Illinois—and in Edwardsville--may rapidly decline within the next few years, which could quickly lead to endangered status. Should this occur, the owners of wind turbines which cause bat mortality will need to act promptly to reduce what will then be unlawful takings of endangered species. For this reason, resources invested in research, avoidance, and mitigation of bat losses today will pay important dividends in the future.

For the Detailed Action Report, please supply a plan drawing to scale of the installed location of the wind turbine. The Department may modify its recommendations upon the evaluation of new or additional information as it becomes available.

In accordance with 17 Ill. Adm. Code 1075.40(h), Southern Illinois University at Edwardsville must notify the Department of its decisions regarding these recommendations, whether it will:

- Allow the action to proceed as originally proposed; or
- Modify the action per Department recommendations (please specify which measures will be taken, or what alternatives will be pursued, if not all recommendations will be implemented).

Consultation is valid for two years unless new information becomes available which was not previously considered; the action is modified; or additional species, essential habitat, or Natural Areas are identified in the vicinity. If any of the above-listed conditions develop within two years of the date of this letter a new consultation is necessary.

The natural resource review reflects the information existing in the Illinois Natural Heritage Database at the time of the project evaluation, and should not be regarded as a final statement on the action being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, the applicant must comply with the applicable statutes and regulations. Please contact me if you have questions regarding this review.

Sincerely,

Keith M. Shank
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cc: Jenny Skufca, Illinois Nature Preserves Commission